

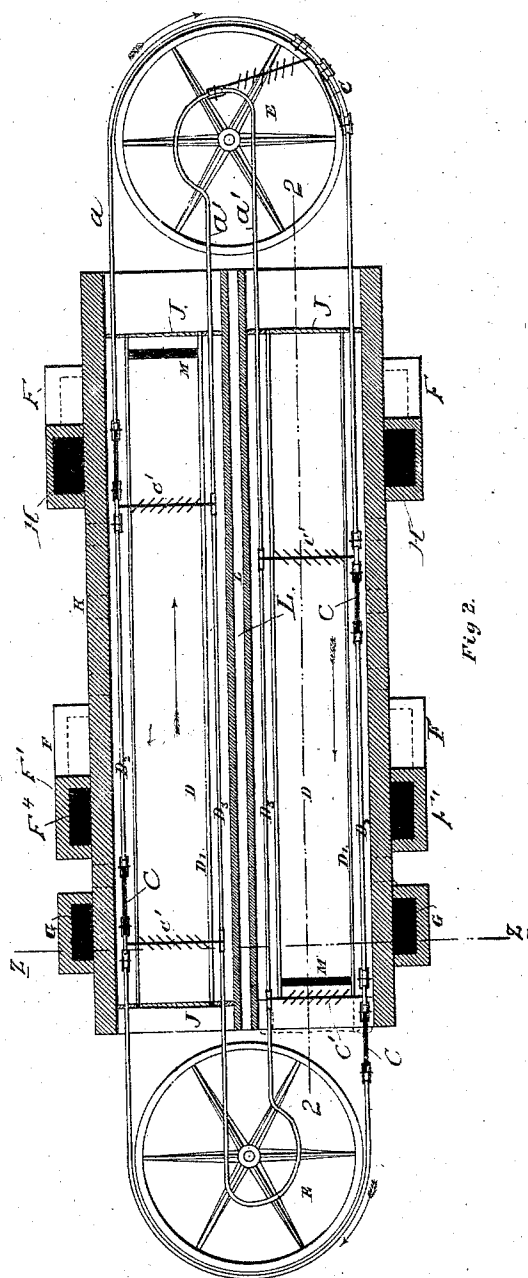
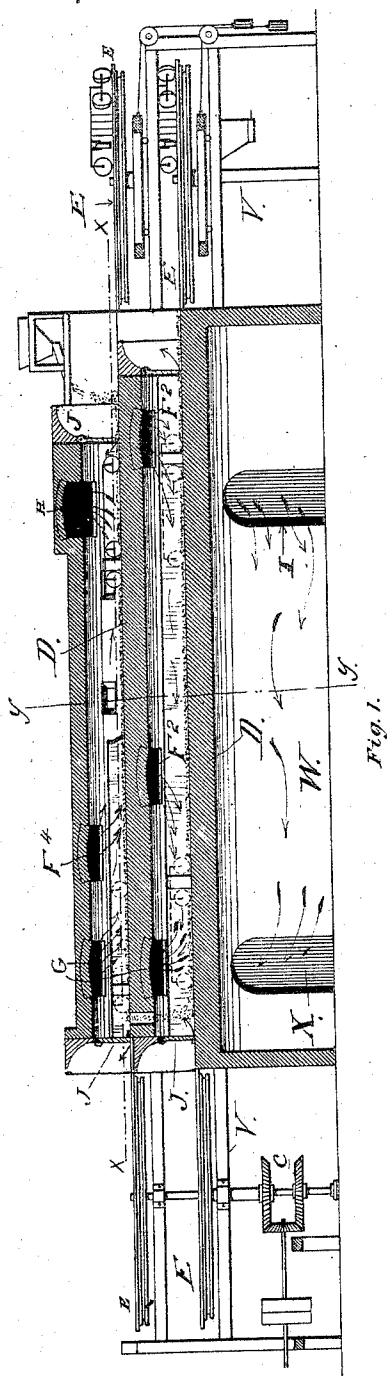
(No Model.)

H. F. BROWN.
ORE ROASTING FURNACE.

4 Sheets—Sheet 1.

No. 489,142.

Patented Jan. 3, 1893.



Witnesses
Thos. J. Root, Jr.
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(No Model.)

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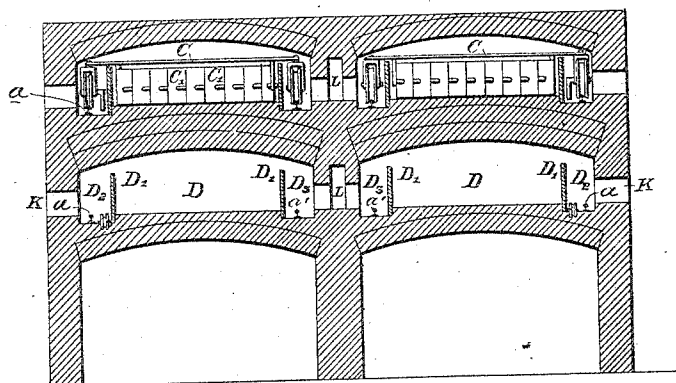


Fig. 3

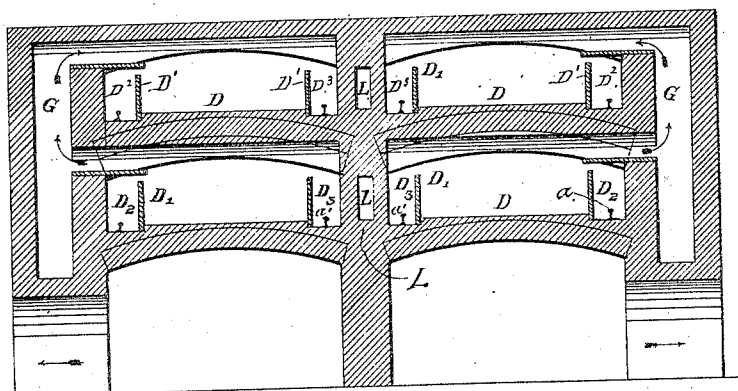
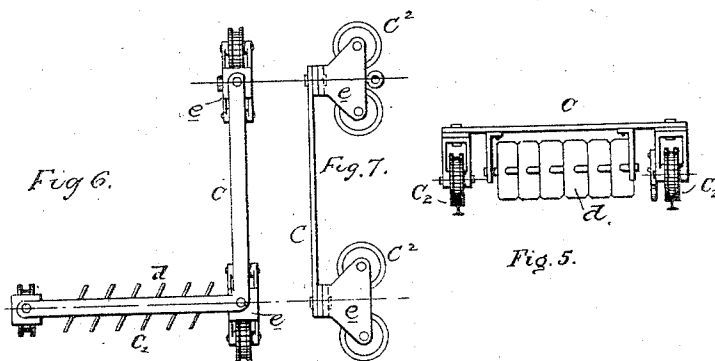


Fig. 4.



2 Witnesses

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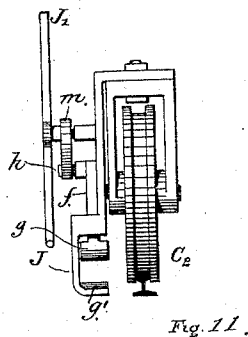
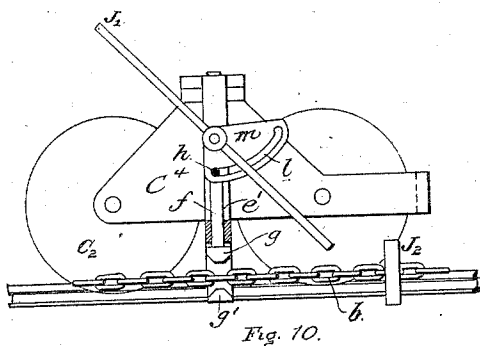
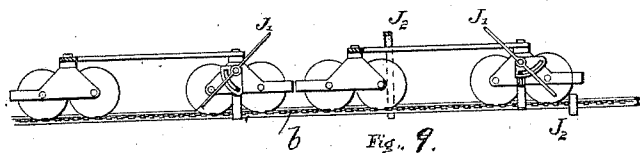
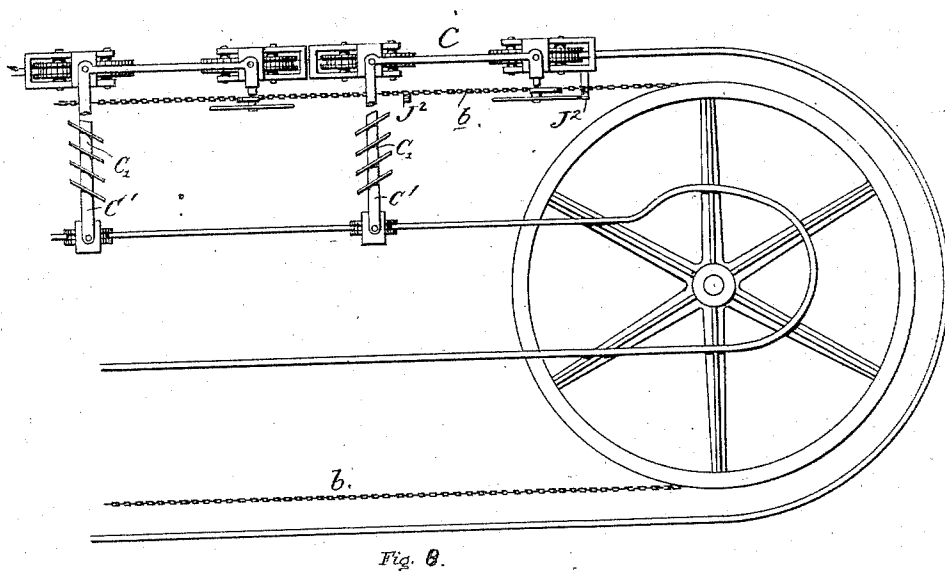
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4 Sheets—Sheet 3.

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Fig. 12

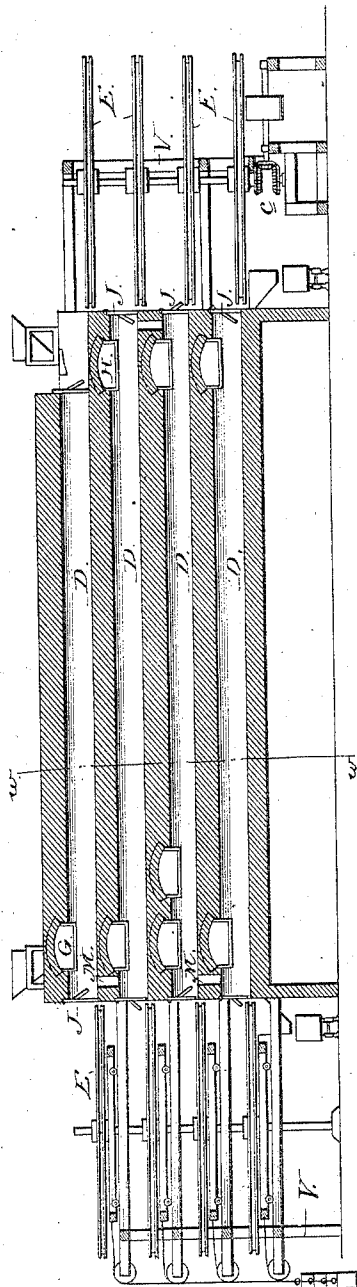
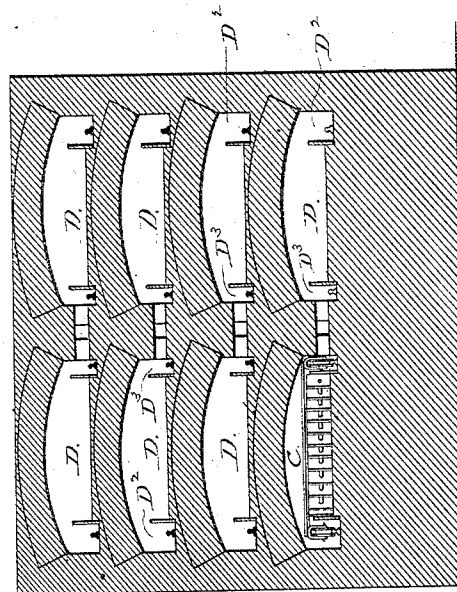


Fig. 13.



Witnesses

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UNITED STATES PATENT OFFICE.

HORACE F. BROWN, OF BUTTE, MONTANA, ASSIGNOR TO MARY C. BROWN, OF CHICAGO, ILLINOIS.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 489,142, dated January 3, 1893.

Application filed March 31, 1892. Serial No. 427,225. (No model.)

To all whom it may concern:

Be it known that I, HORACE F. BROWN, a citizen of the United States, residing at Butte, in the county of Silver Bow and State of Montana, have invented certain new and useful Improvements in Ore-Roasting Furnaces, as set forth in the accompanying drawings, forming part of this specification, in which—

Figure 1, is a longitudinal sectional view of my improved ore roasting furnace, taken on line 2—2, of Fig. 2. Fig. 2, is a horizontal sectional view on the line $x-x$ of Fig. 1. Fig. 3, is a cross sectional view on the line $y-y$ Fig. 1. Fig. 4, is a similar view on the line $z-z$ of Fig. 2. Figs. 5, 6 and 7, illustrate detached views of one of the carriages with its stirrers and adjunctive parts. Fig. 8, is an enlarged view showing in plan one end of the track, one of the horizontally disposed pulleys, and two of the carriages. Fig. 9, is a side view of two of the carriages with their gripping mechanisms. Fig. 10, is an enlarged view of the gripping mechanism. Fig. 11, is an end view of Fig. 10. Fig. 12, is a longitudinal sectional view of a double four-hearth furnace. Fig. 13, is a cross sectional view of the same on the line $w-w$ of Fig. 12.

My invention relates to that class of furnaces, known as reverberatory furnaces for the roasting of ores containing precious metals, and my invention consists of the constructions and combinations of parts, forming the improved furnace, as I shall hereinafter fully describe and claim.

To enable others skilled in the art to which my invention appertains to make and use the same, I will now describe its construction and indicate the preferred manner in which the same is carried out.

In the accompanying drawings I have shown the chambers or hearths D , arranged in pairs one above the other with intervening arches, and with the chambers or hearths of one pair communicating with those of the pair immediately below them by means of the openings M , whereby the roasted ore may be transferred from the hearths of one pair to the hearths of the pair next below them. By arranging the chambers or hearths in pairs, each pair will be on the same horizontal plane, and will be separated from each other by means

of a hollow wall or partition L having an air space between its inner sides.

Along the inner sides of each hearth are placed diaphragms or partitions D' forming side compartments similar to those shown, described and claimed in my former Patent No. 471,264 granted to me March 22 1892, and within these side compartments D^2 D^3 are laid track rails a a' both of which extend beyond the ends of the chambers or hearths, as shown in Fig. 2. The track rails a are to be located within the outside compartments D^2 while the rails a' occupy the inner compartments D^3 , the said rails a having their outer extending ends curved into semi-circular form, to form a continuous guide upon which the carriages to be hereinafter mentioned may be transferred from the chamber of one hearth to the chamber of the opposite hearth of the same pair. The rails a' occupy the inner compartments D^3 of each pair of hearths and their extended ends are curved to form guides for the inner ends of the carriages, these guides being reversely arranged as shown in Fig. 2 to properly guide the inner section or portion of the carriage as the latter moves out of one compartment to the compartment adjoining it on the side.

Each main chamber D has its ends closed by suitable doors or dampers J , the combinations and operations of which are similar to those shown in my said former patent, and upon a suitable frame work V at the ends of the furnace are the horizontally mounted pulleys E around which the endless chains b pass, the rims of said pulleys being concentric with and close to the curved ends of the track rails a , as shown, and one set of pulleys being connected with gearing c or other well known means for effecting the rotation of the pulleys and the consequent travel of the carriages through the furnace.

The partitions or diaphragms D' which form the supplemental side compartments, extend from the floor of the main hearths or compartments high enough to confine the ore upon the main hearths, and also to protect, in a great measure, the track rails, chains or ropes, and the wheeled frames of the carriages from the direct action of the heat and fumes within the main compartments. The central

or dividing wall L, between the compartments of each horizontal pair of hearths, is made hollow or with an air space to insure a free circulation of air for keeping the wall comparatively cool, and at the same time furnish free oxygen for the desulphurization of the ore; the outer walls of the furnace being also provided with openings K for admitting air.

The furnace is also provided with any well known form of upper and lower fire boxes K' F the heat developed in the lower fire boxes entering the lower hearth through the flues F² and passing out through the flue G to the upper hearth so as to convey the smoke and gases from the lower hearth to the upper hearth, independent of the opening through which the ore falls to the lower hearth. Should the gases be taken up through this connecting opening M between the two hearths, it would create such a strong draft that a large amount of the fine ore would rise in the form of dust and cause considerable loss by passing off with the gases. The flue F⁴ from the upper fire box leads to the upper hearth as shown and the combined gases pass into the down flue H and enter at I into the dust flue W to the flue X which leads to the stack in any suitable manner. By this means the heat arising from the first hearth is utilized in burning the sulphur from the ores in the hearths above, and in case of ores carrying a high per-centage of sulphur, the heat caused by the burning off of this sulphur would be sufficient to carry on and complete the operation, by the constant addition of fresh ore, without any additional fuel, after the furnace was once thoroughly heated. To more thoroughly utilize the heat required for roasting the ores, the furnaces are preferably constructed with the series of hearths one above the others, the ore being discharged through the openings M, to the hearths next below, and being moved to alternate ends until finally discharged from the lower hearth in any appropriate manner.

The carriages are of peculiar form and are let into the lengths of the chains in suitable manner, and they each consist of an angle bar one arm C of which lies above and parallel with the track rail *a* while its other arm C' extends transversely across the roasting chamber and is provided with stirring blades or plates *d*.

To the outer ends of the arms C C' of the frames of the carriages, and also at the angular junction of said arms, are pivotally secured frames or supports *e* in which wheels or rollers C² are mounted, whereby the wheels at the outer end of the arm C and also at the junction of said arm with the arm C' are adapted to travel upon the rails *a*, while the wheels at the outer end of the other arm C' are adapted to travel upon the rails *a'* to steady and support said arm C'. From this description it will be seen that the rope or chain is actuated by means of the horizontal pulleys and driving mechanism shown, and the carriages

are drawn through the compartments D², D³ with the stirring blades operating upon the mass of roasting ore on the hearth. As each carriage leaves the hearth the forward point of the bar which forms the arms C and C' commences to follow the curvature of the track rail, while the other side of said bar begins to fall back; the frames of the wheels C² turning about their pivots to allow the free movement of the carriage in passing around the curved portions of the tracks. After the carriage has passed around the curved track portions its wheels C² are directed into their respective compartments; and the carriage moves forward in the chamber at one side of the one it had previously left. By this arrangement I am enabled to build my furnaces with their roasting hearths side by side, and close together, thereby lessening the cost of construction, permitting the carriages to be automatically transferred from one hearth to another on the same horizontal plane, and enabling the component parts of the carriages to move about the vertical axis of the horizontal pulleys without interference therewith.

The carriages, as before stated are secured to the chains by means of a suitable clutch or grip, as for instance that shown in Figs. 8 to 11 inclusive. These clutches or grips, consist of a suitable frame work C⁴ having a vertical guide way *e'* for a bar *f* whose lower end is formed with a jaw *g*, shaped to fit within the links of the chains as shown in Fig. 10. The upper end of the bar *f* has a lateral stud or projection *h* which extends into a cam-shaped slot *l* formed in a plate *m* pivotally mounted upon the frame C⁴, and upon the axis of this plate is a rod or lever J' into contact with which suitable fixed stops J² are adapted to come, whereby the rod J' is tripped from the position shown at the right of Fig. 9 into the position shown at the left of said figure. This movement of the rod J' causes the plate *m* to turn upon its axis, and the cam groove *l* to force the bar *f* downward until its jaw *g* is forced into one of the links of the chain and into contact with a fixed jaw *g'* formed on a part of the frame C⁴ thereby automatically locking the carriage to the chain. These features are essential in furnaces of this class for the reason that in all mechanically stirred furnaces the plows or stirrers become somewhat heated in passing through the furnace, and it is necessary to carry the ends of the furnace outside of the roasting hearths to allow time for the stirrers to cool as they pass around before entering the next hearth. To obviate these difficulties and at the same time avoid the construction of housings, I employ the construction and devices described.

In operation one or more of extra carriages are placed upon the tracks as shown in Fig. 8 with the clutching devices open. These carriages stand in this position until one of the working carriages comes along and pushes the idle carriage forward until the lever or rod J' engages one of the stops J² when the

clutching devices are operated to cause the movable jaw *g* to be forced tightly against the moving chain and fixed jaw *g'* whereby the carriage is locked to the chain and the latter

5 draws the carriage through the furnace. While the heretofore idle carriage is being locked to the chain, the former active carriage which, up to this time was moving with the chain, is thrown out of engagement with
10 said chain by the reverse movement of the gripping devices, and now becomes the idle carriage and remains at rest until the next succeeding carriage meets it when it is again locked to the chain in the manner before described. By reason of these constructions
15 each carriage remains in the open air a sufficient length of time to neutralize the effects of the heat imparted to the arms and stirrers in passing through the furnace, and by constructing the furnace with two or more compartments one above the other, each roasting
20 hearth can be made comparatively short and the requisite number of square feet of roasting surface obtained by duplication of the hearths, as shown in Figs. 12 and 13 wherein
25 is disclosed an eight-compartment furnace. Also it is obvious that the shorter the construction of each hearth, the time in which the stirrers are exposed to the action of the
30 heat between cooling periods, is very much lessened, and consequently a much higher heat can be carried in the furnaces without injury to the operating mechanism.

Having thus described my invention what I claim as new and desire to secure by Letters
35 Patent, is:—

1. An ore-roasting furnace having roasting hearths placed side by side on the same horizontal plane, stirrers operating in said hearths
40 and means for transferring the stirrers from one hearth to another.

2. An ore roasting furnace having a plurality of hearths placed side by side on the same horizontal plane, continuous track rails in
45 said hearths with connected curved end portions, and carriages transferable on said track rails from one hearth to the other and provided with means for agitating and advancing the ore on the hearths.

3. An ore roasting furnace comprising roasting chambers arranged in pairs with the chambers of one pair placed side by side on the same horizontal plane, stirrers operating in
50 said chambers, and means for transferring the stirrers from one chamber of each pair to the other chamber of the same pair.

4. An ore roasting furnace having roasting chambers placed side by side on the same horizontal plane, tracks in said chambers with
60 horizontally disposed curved ends whereby a continuous track is formed from one chamber to another on the same plane, and wheeled carriages adapted to travel on said tracks and to be automatically transferred from one
65 chamber to another, said carriages being provided with means for stirring the ore.

5. An ore roasting furnace having roasting chambers placed side by side on the same horizontal plane, tracks within said chambers having curved ends whereby continuous track
70 surfaces are formed between adjacent chambers, carriages adapted to travel on said tracks and provided with stirring devices, an endless chain passing into one chamber in one direction and into the other chamber in an opposite
75 direction, and horizontally disposed pulleys forming guides for the chain.

6. An ore roasting furnace having separated roasting chambers placed side by side on the same horizontal plane, a hollow wall
80 forming an air space between said chambers tracks in said chambers having curved ends connecting the tracks of one chamber with those of the adjoining one, carriages movable on said tracks and provided with stirring devices, and means for operating the same, substantially as herein described.

7. An ore roasting furnace comprising roasting chambers side by side on the same horizontal plane, tracks along the walls of said
90 chambers, having outer ends whereby a continuous track surface is formed between contiguous chambers, horizontally disposed pulleys at the ends of the furnace, means for operating the pulley, an endless chain passing
95 around said pulleys, and wheeled carriages connected with said chains and traversing the chambers in opposite directions, said carriages being provided with stirring devices, substantially as herein described.

8. An ore roasting furnace having a roasting hearth, a chain passing through said hearth and stirring devices, in combination with means actuated by the movement of the
100 chain for clamping the stirring devices to the chain.

9. An ore roasting furnace having roasting hearths, chains passing through the same, and carriages provided with stirring devices, in combination with fixed stops, and a gripping
110 mechanism on said carriages actuated by contact with said stops for automatically attaching said carriages to the chain, and releasing them therefrom, substantially as herein described.

10. In an ore roasting furnace having chains passing through it and provided with carriages having stirring devices, fixed stops in the path of the carriages, and gripping mechanisms on said carriages comprising fixed
120 jaws, and movable jaws automatically operated by contact with said stops for clamping the carriages to the chains.

11. The combination with an ore roasting furnace having roasting hearths with tracks
125 surfaces therein and extended beyond the ends of the hearths, of carriages movable on said tracks and provided with fixed movable gripping jaws and stirring devices, movable chains to which the carriages are clamped, and stops in the path of the carriages for tripping the movable gripping jaws and releasing

ing the carriages from the chains at intervals, substantially as and for the purpose herein described.

12. In an ore roasting furnace, the combination with roasting hearths, the endless chains passing through both hearths and means for actuating the chains, of a series of carriages provided with stirring devices, fixed stops in the path of the carriages, and gripping jaws on said carriages automatically operated by contact with said stops for releasing the carriages from the chains at intervals, substantially as and for the purpose herein described.

13. In an ore roasting furnace the main roasting chambers placed side by side and having supplemental chambers at the sides provided with track rails having curved outer ends, the means for advancing and stirring the ore comprising an angular bar forming the arms C C' provided with swiveled wheeled frames, one of said arms movable in the supplemental chamber at one side of the furnace while the other arm extends transversely across the roasting hearth and has its outer end supported in the supplemental chamber at the opposite side, said transverse arm being provided with stirring devices, substantially as herein described.

14. An ore roasting furnace having its main roasting chambers placed side by side and provided with supplemental side compartments, the track rails in said side compartments, connecting one roasting chamber with

the other endless chains passing through said compartments, and means for operating the chains, in combination with the carriages consisting of the arms C C' at right angles to each other, and swiveled wheeled frames located at the outer ends of said arms and also at their inner junction, said arms C movable within one of the side compartments while the arms C' extend transversely across the roasting hearth with their outer end supported in the opposite side compartment, and provided with stirring devices, substantially as herein described.

15. An ore roasting furnace having roasting hearths, placed side by side, endless chains passing through both hearths and means for operating the chains, in combination with the wheeled carriages provided with stirring mechanism, the frames C' of said carriages having a stationary gripping jaw, a gripping jaw movable in said frame, a pivotally secured plate having a cam slot engaging the movable jaw, a rod or lever on the axis of the plate, and stops in the path of the carriages for tripping said rod or lever and releasing or applying the gripping mechanism whereby the carriages are attached to or released from the operating chains, substantially as herein described.

HORACE F. BROWN.

Witnesses:

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I. M. WALKER.